



MARYMOUNT CONVENT SCHOOL

Name: Melissa Lee

Index No: _____

Subject: A level math - Functions

Class: _____

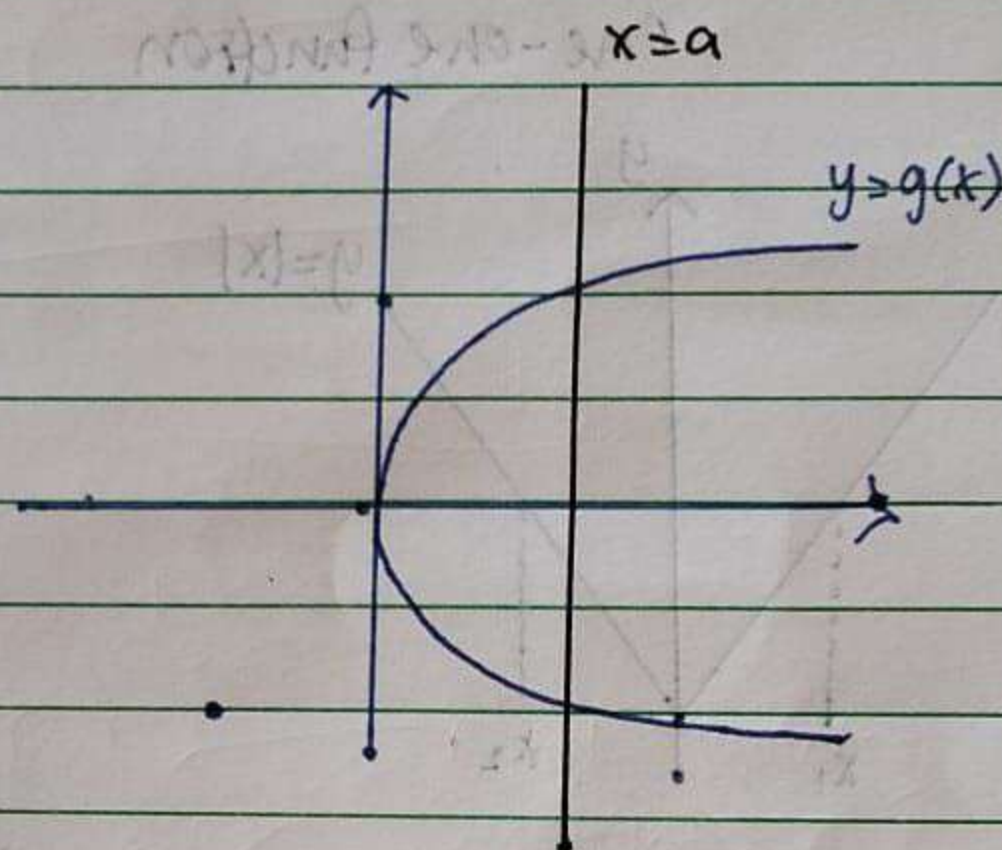
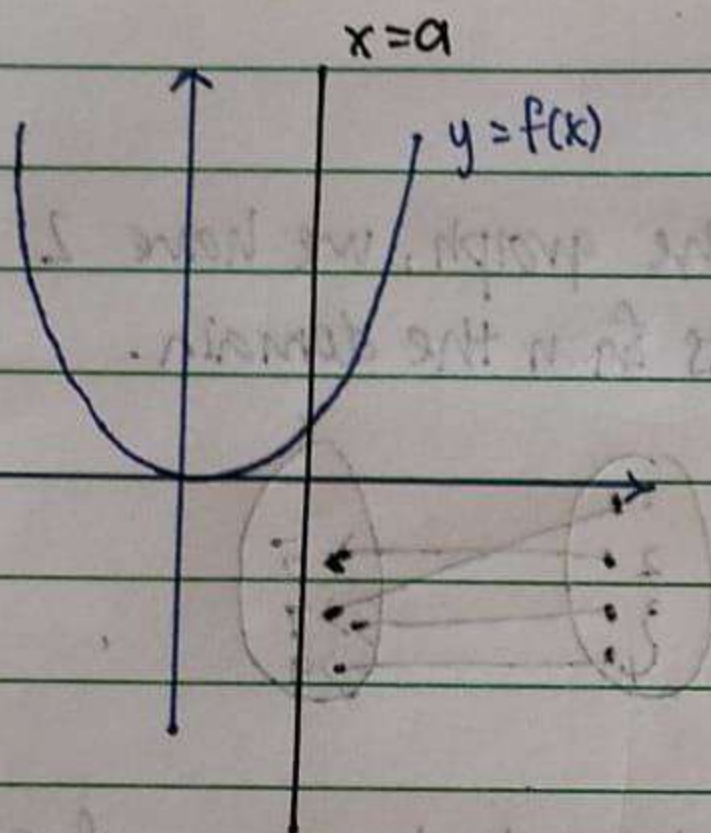
Date: 23/7/2024

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1.1) concepts of function, domain & range

Function: unique x value as input generate out unique y value
output

(a)

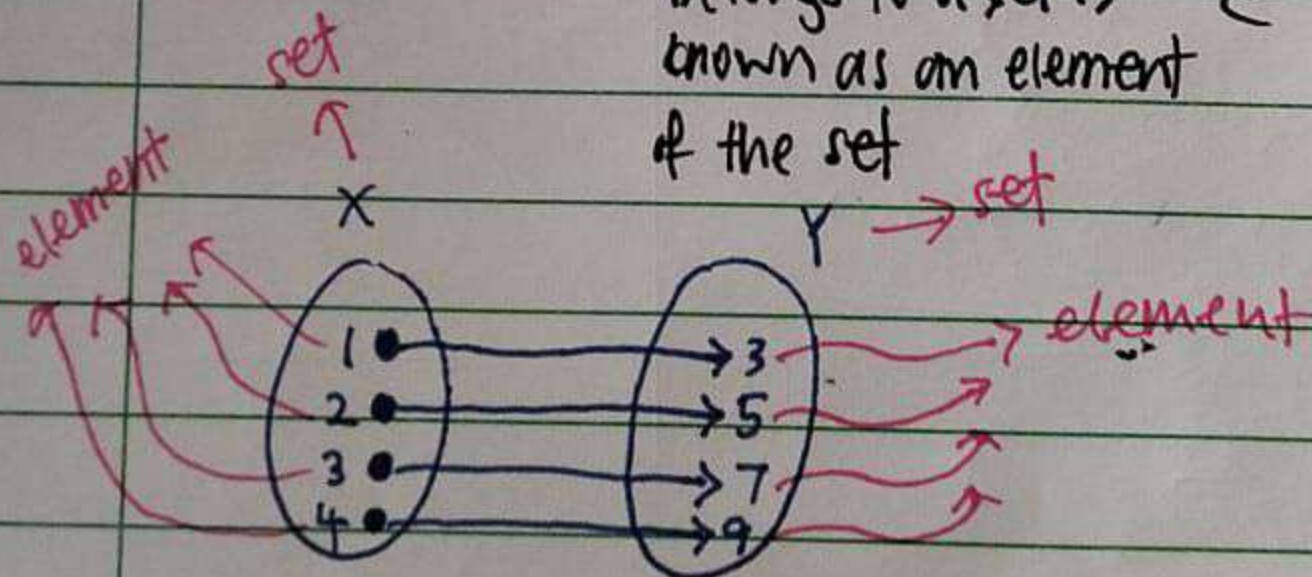


1 value of x cuts 1 value of y \Rightarrow function
1 value of x cuts 2 values of y \Rightarrow Not function

Relation: Association that relates elements of one set to another.

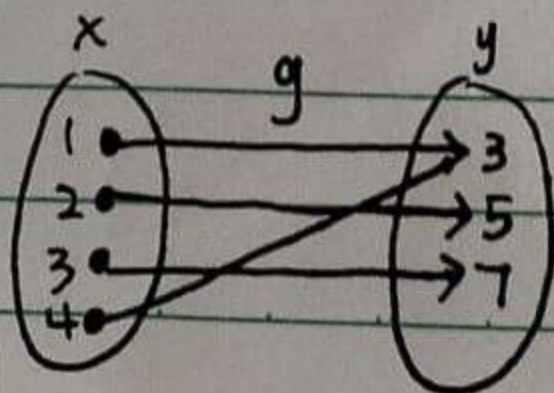
Every object that belongs to a set is known as an element of the set

A set is a well defined collection of distinct objects.



Domain: Set x is the domain of function f such that $y=f(x)$

Range: Every element y is the image of elements x under function f.



function $g \Rightarrow y=g(x)$

Domain of $g \Rightarrow \{1, 2, 3, 4\} \Rightarrow$ elements of x

Range of $g \Rightarrow g(x) \Rightarrow \{3, 5, 7\}$



The functions f and h are given as $f: x \mapsto x^3+1, x \in \mathbb{R}$ and $h: x \mapsto e^{-2x}, x \in \mathbb{R}$. Find the inverse functions $f^{-1}(x)$ and $h^{-1}(x)$ respectively.

→ inverse notation

Let $y = f^{-1}(x)$ as we are finding inverse function.

$$f(y) = f(f^{-1}(x)) = x$$

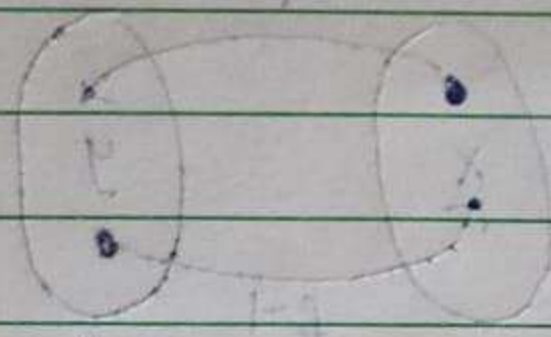
$$f(x) = x^3+1 \Rightarrow f(y) = y^3+1 = x$$

$$y^3+1 = x$$

$$y^3 = x-1$$

$$x \mapsto y: f^{-1}(x) = y = \sqrt[3]{x-1} \text{ (found)}$$

$$f^{-1}(x) = \sqrt[3]{x-1}, x \in \mathbb{R}$$



Let $y = h^{-1}(x)$

$$h(y) = h(h^{-1}(x)) = x$$

$$h(x) = e^{-2x} \Rightarrow h(y) = e^{-2y} = x$$

$$\ln e^{-2y} = \ln x$$

$$-2y \ln e = \ln x$$

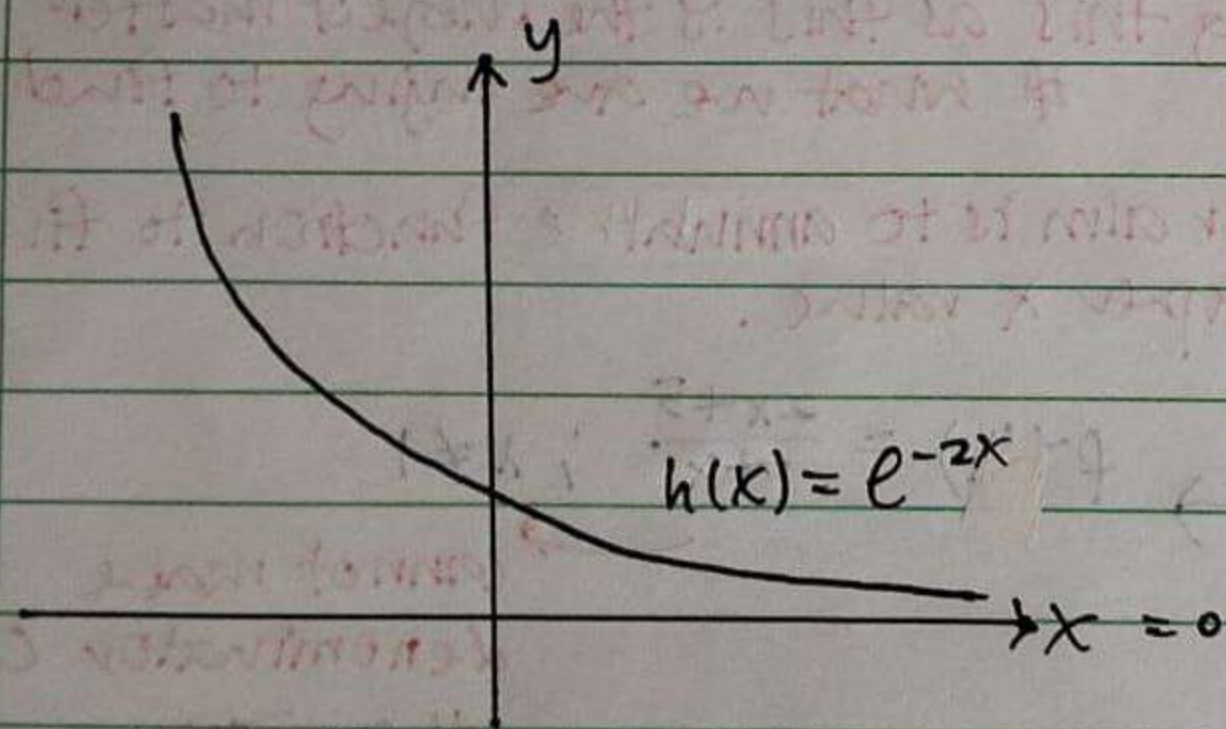
$$-2y = \ln x$$

$$h^{-1}(x) = y = \frac{\ln x}{-2}$$

$\ln e^1 = 1$, according to calculator

$$h^{-1}: x \mapsto -\frac{1}{2} \ln x, x > 0$$

→ the graph will never reach asymptote $x=0$





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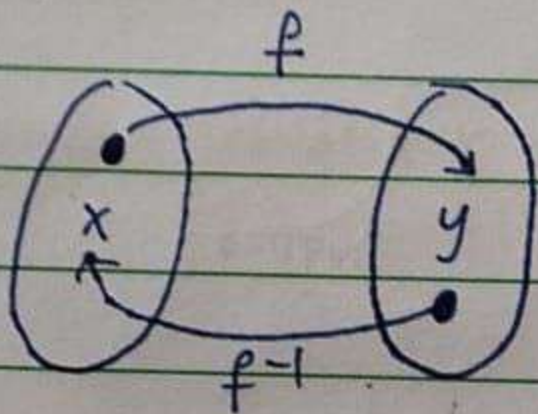
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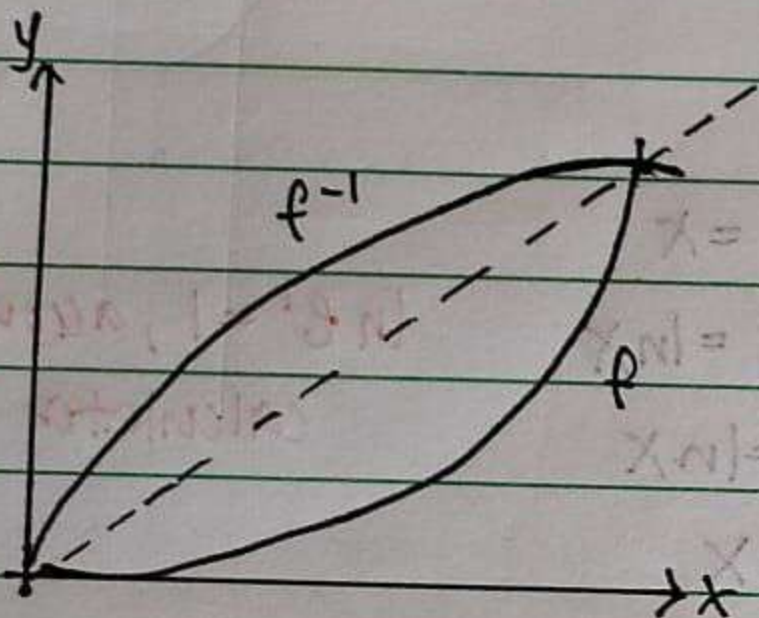
only 1-1 functions have inverses.



$$y = f(x) \iff f^{-1}(y) = x$$

$$f: x \mapsto y \iff f^{-1}: y \mapsto x$$

where domain of f^{-1} is range of f , and range of f^{-1} is domain of f .



Examples

Find the inverse of $f(x) = \frac{x-5}{x+2}; x \neq -2$

Let $y = f^{-1}(x)$

$\rightarrow f(y) = f f^{-1}(x) = x$

if $f(x) = \frac{x-5}{x+2}$, then

$f(y) = \frac{y-5}{y+2} = x$ so

$\rightarrow f(y) = \frac{y-5}{y+2} = x$

$y-5 = x(y+2)$

$y-5 = xy+2x$

$y-xy = 2x+5$

$y(1-x) = 2x+5$

$\rightarrow y = \frac{2x+5}{1-x}$

$f^{-1}(x) = \frac{2x+5}{1-x}; x \neq 1$

cannot make denominator 0 otherwise undefined.

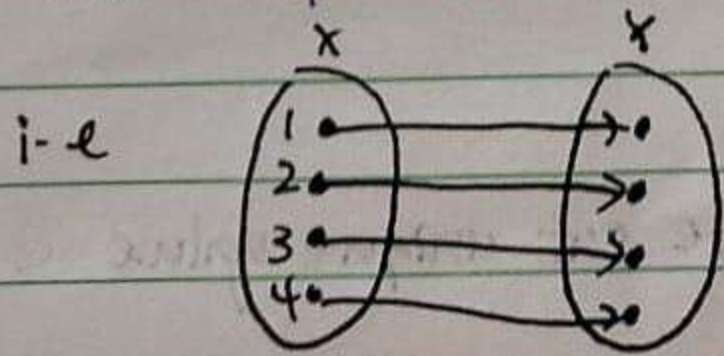
doing this as this is the subject matter of what we are trying to find

our aim is to annul the function to find proper x value.

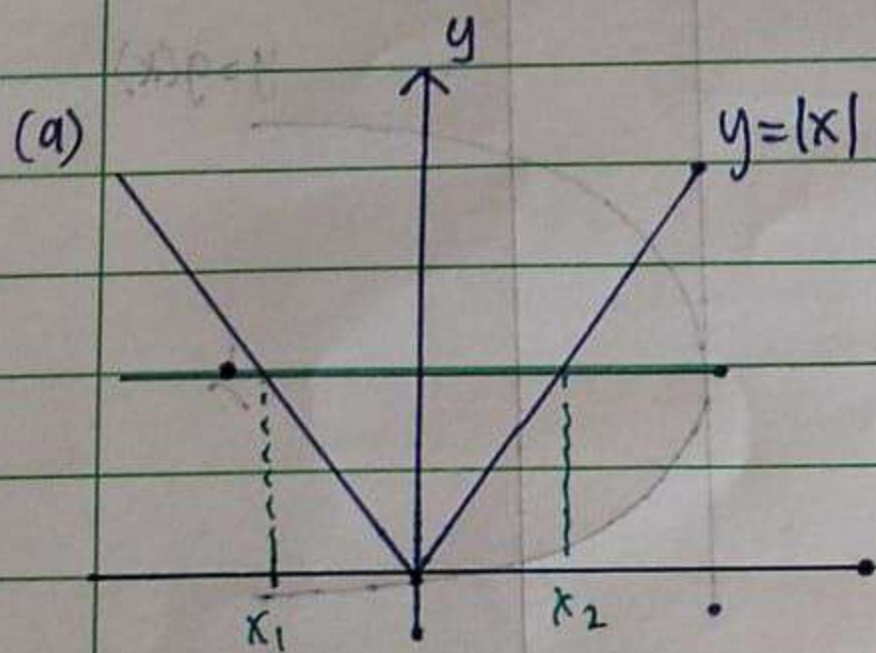


Inverse functions and composite function

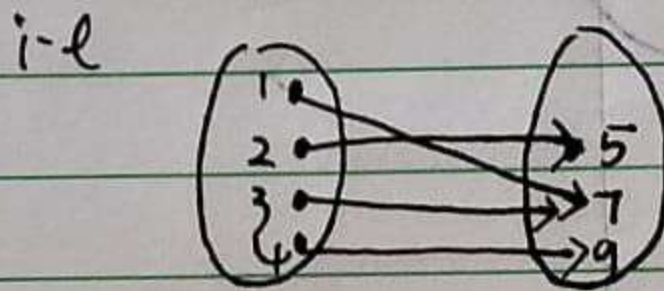
One-One function: When 1 unique element in range of set Y associates with 1 unique element in domain of set X



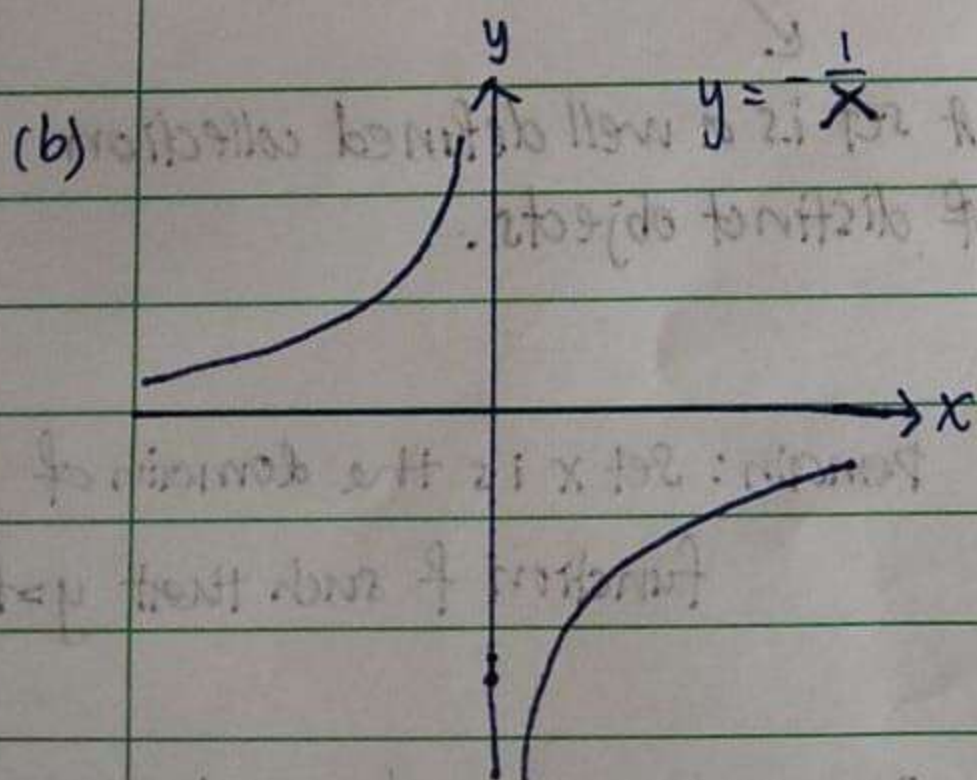
One-one function



from the graph, we have 2 elements from the domain.



when 2 elements in range of set Y associates with 1 unique element in domain of set X, it is not 1-1 function anymore. It is 1-many function.



1-1 function.

